

# Defining Level of Development Specifying BIM Deliverables

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*HOK*

# Level of Development

## AIA Document E202™ – 2008

### Building Information Modeling Protocol Exhibit

This Exhibit is incorporated into the accompanying agreement (the "Agreement") dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ (In words, indicate day, month and year.)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

#### BETWEEN

(Name, address and contact information, including electronic addresses)

#### AND

(Name, address and contact information, including electronic addresses)

for the following Project:  
(Name and location or address)

#### TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 PROTOCOL
- 3 LEVEL OF DEVELOPMENT
- 4 MODEL ELEMENTS

#### ARTICLE 1 GENERAL PROVISIONS

§1.1 This Exhibit establishes the protocols, expected levels of development, and authorized uses of Building Information Models on this Project and assigns specific responsibility for the development of each Model Element to a defined Level of Development at each Project phase. Where a provision in this Exhibit conflicts with a provision in the Agreement into which this Exhibit is incorporated, the provision in this Exhibit will prevail.

§1.1.1 The parties agree to incorporate this Exhibit by reference into any other agreement for services or construction for the Project.

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### § 4.3 Model Element Table

Identify (1) the LOD required for each Model Element at the end of each phase, and (2) the Model Element Author (MEA) responsible for developing the Model Element to the LOD identified.

Insert abbreviations for each MEA identified in the table below, such as "A – Architect," or "C – Contractor."

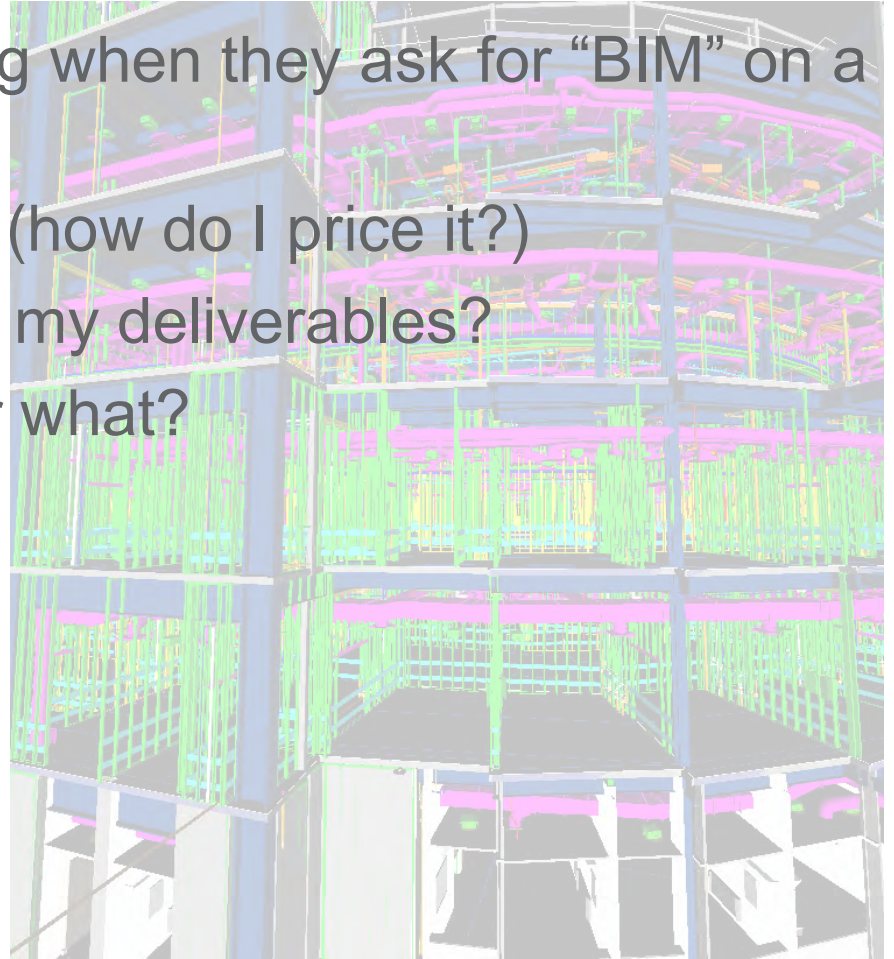
NOTE: LODs must be adapted for the unique characteristics of each Project.

						Conceptualization		Criteria Design		Detailed Design		Implementation Documents		Construction		Note Number (See 4.4)
Model Elements Utilizing CSI UniFormat™						LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	
A SUBSTRUCTURE	A10 Foundations	A1010 Standard Foundations			100		200		300		400		500			
			A1020 Special Foundations		100		100		300		400		500			
			A1030 Slab on Grade		100		200		300		400		500			
	A20 Basement Construction			100		200		300		400		500				
		A2010 Basement Excavation		100		200		300		400		500				
		A2020 Basement Walls		100		200		300		400		500				
B SHELL	B10 Superstructure			100		200		300		400		500				
		B1010 Floor Construction		100		200		300		400		500				
	B20 Exterior Enclosure			100		200		300		400		500				
		B2010 Exterior Walls		100		200		300		400		500				
		B2020 Exterior Windows		100		200		300		400		500				
		B2030 Exterior Doors		100		200		300		400		500				
	B30 Roofing			100		200		300		400		500				
		B3010 Roof Coverings		100		200		300		400		500				
		B3020 Roof Openings		100		200		300		400		500				
C INTERIORS	C10 Interior Construction			100		200		300		400		500				
		C1010 Partitions		100		200		300		400		500				
		C1020 Interior Doors		100		200		300		400		500				

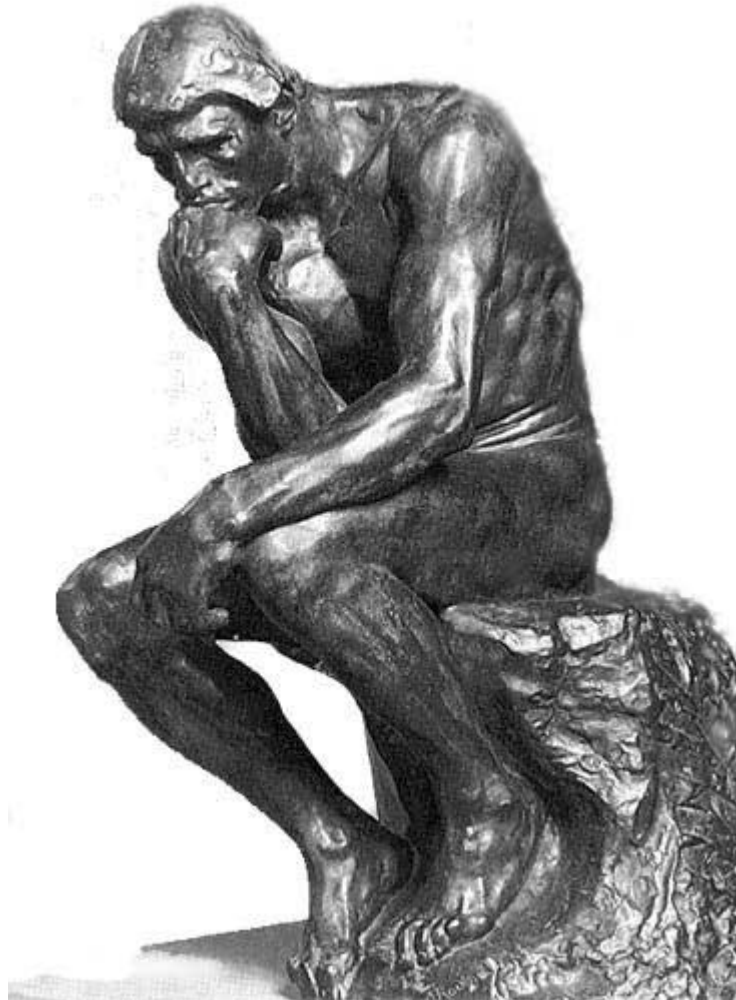


# Problem: How can We Define a BIM?

- What is the owner expecting when they ask for “BIM” on a project?
- How much effort will it take (how do I price it?)
- How do I know I’m meeting my deliverables?
- Who’s going to rely on it for what?
- GIGO

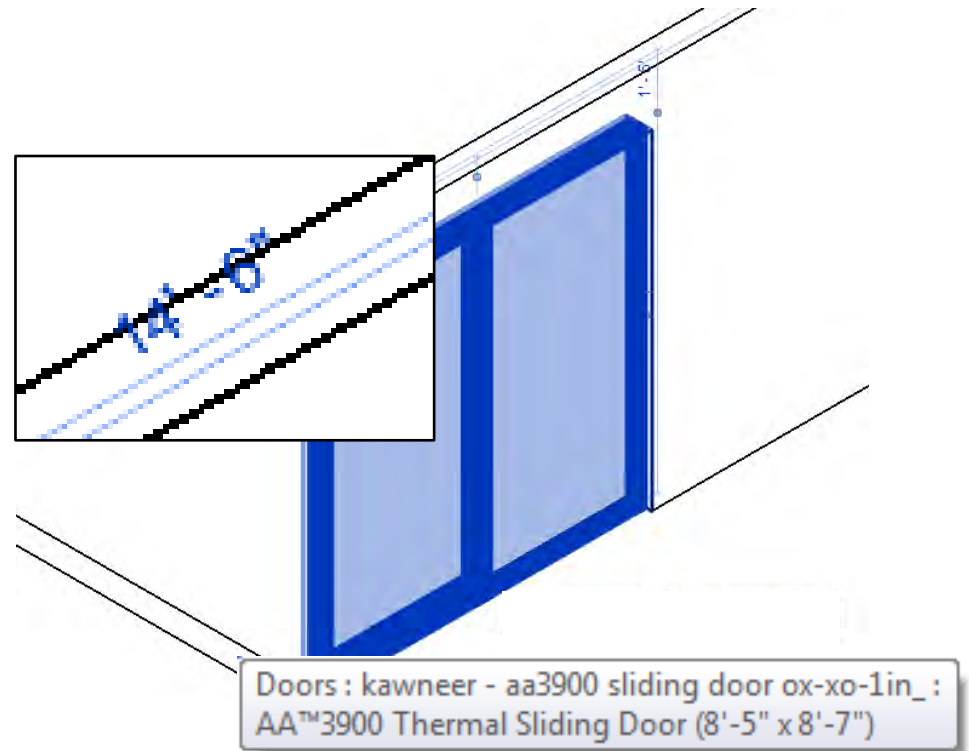
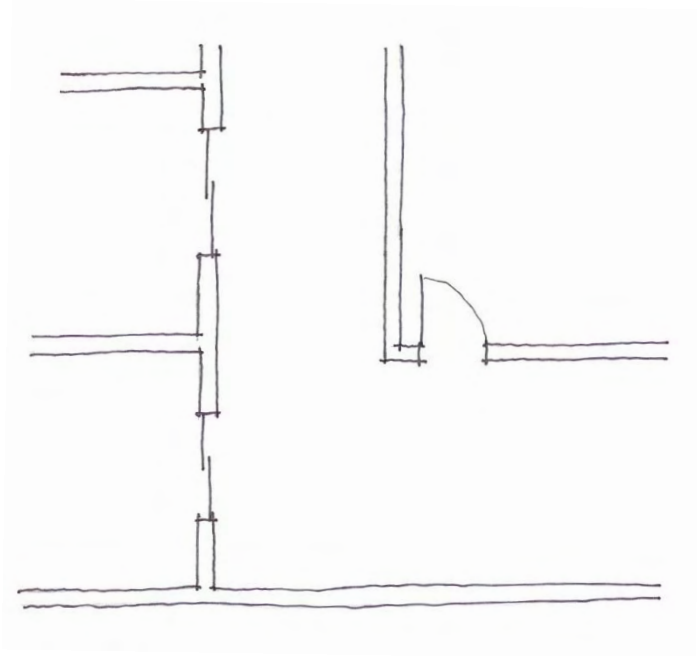


# We Never Had this Problem with Paper Drawings – Why Now?



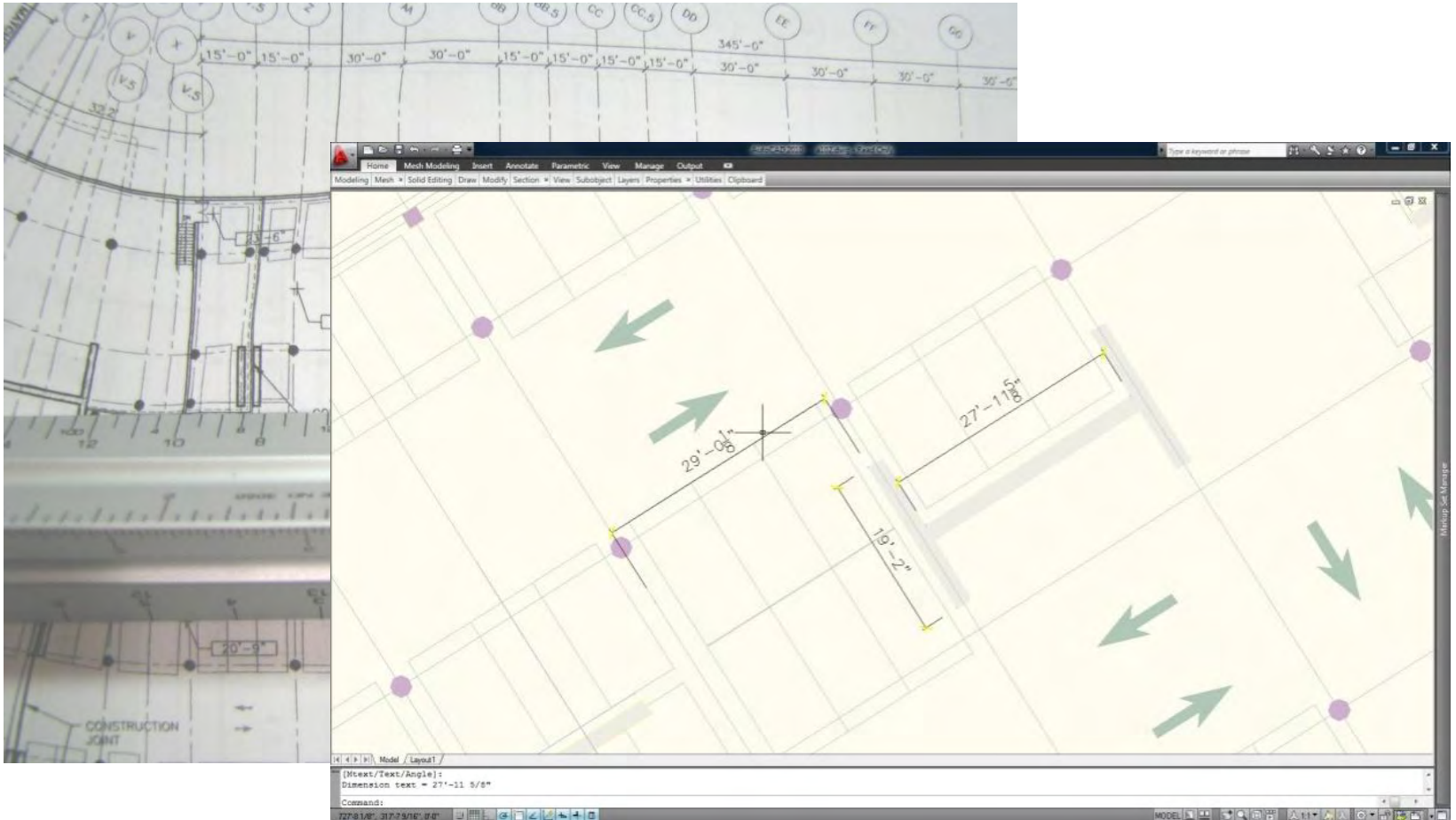
# Paper vs. BIM

Visual cues about state of development



# Paper vs. BIM

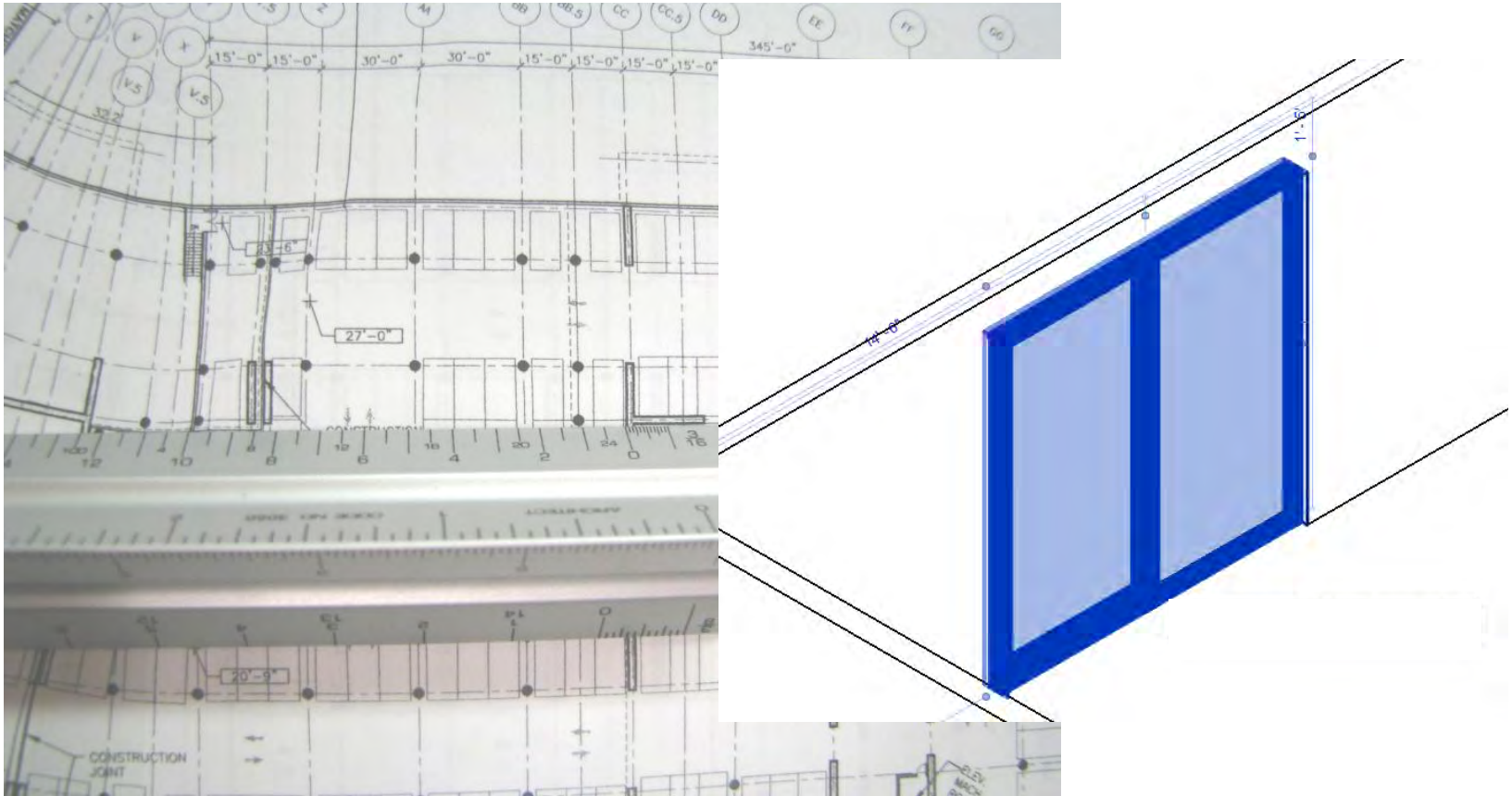
## Precision





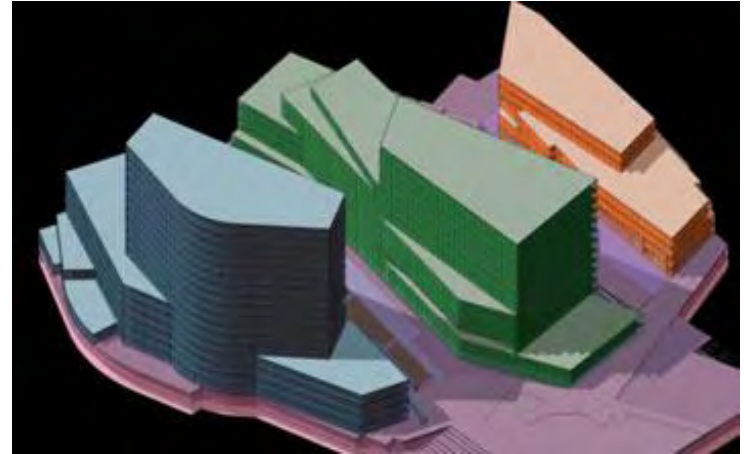
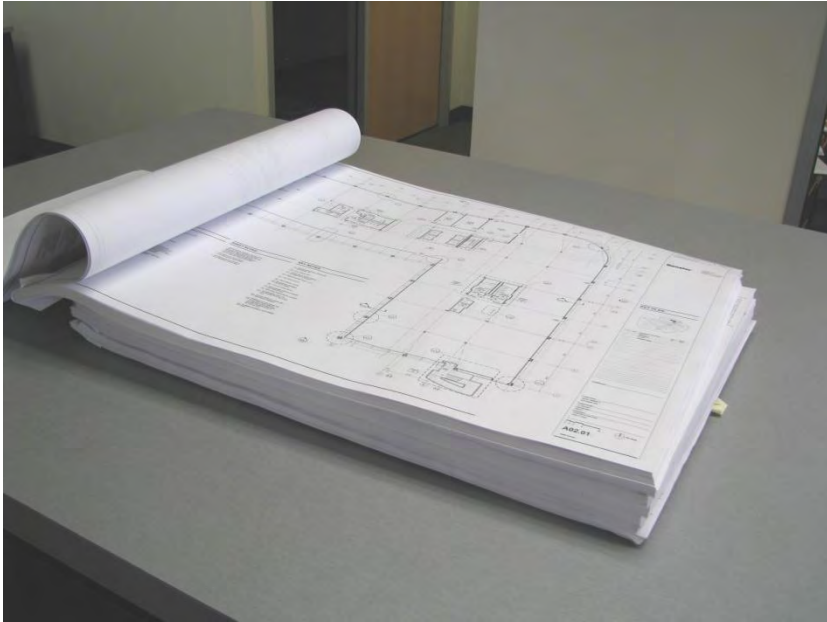
# Paper vs. BIM

All information is vetted



# Paper vs. BIM

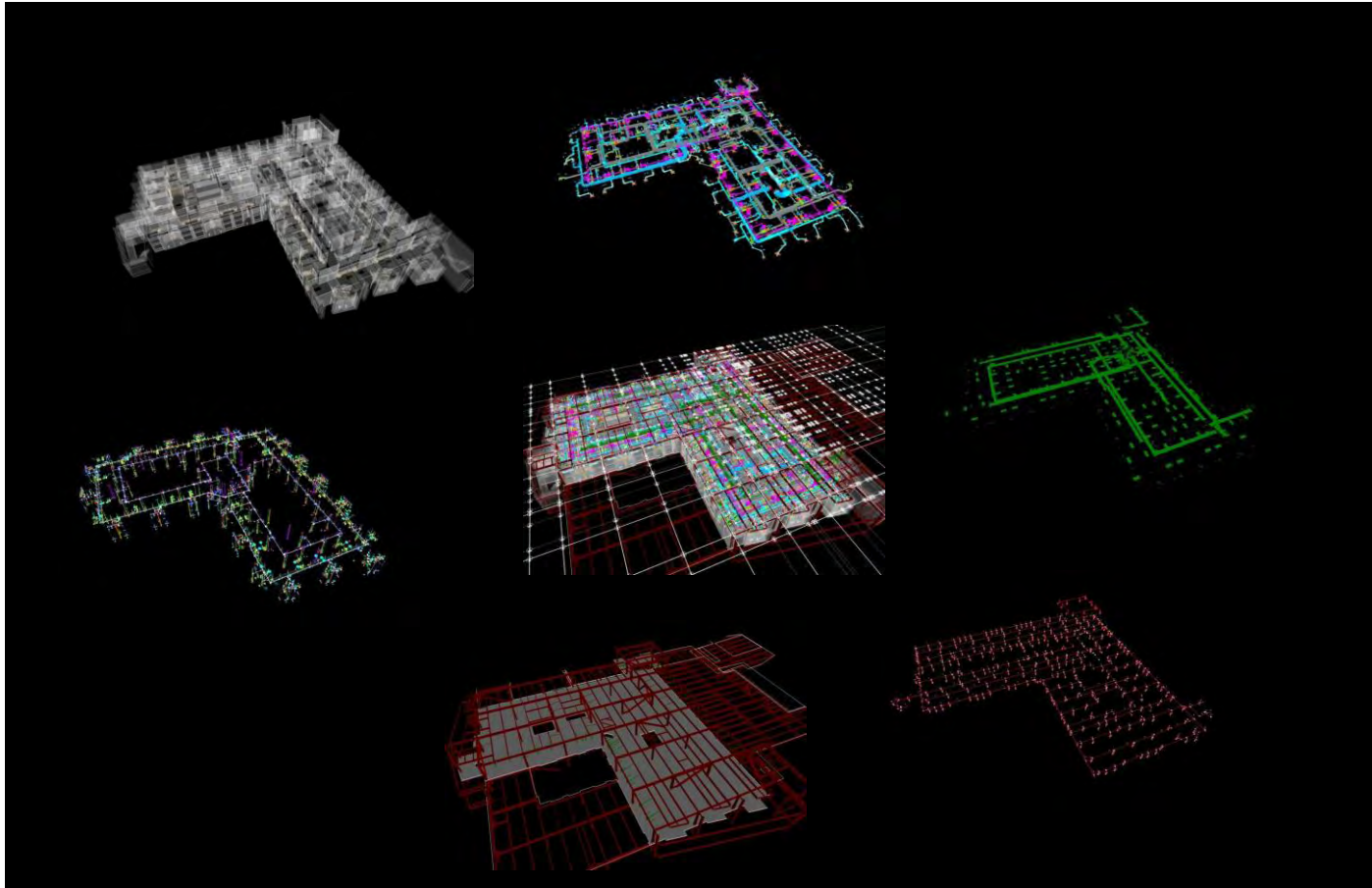
## Deliverables





# Paper vs. BIM

Federated models – who's responsible for what when?



# Response?

## The Disclaimer:

*This model looks great so you can look at it but you can't use it for anything or rely on it for anything which includes, but is not limited to, everything.*

*If you use it for anything anyway then you have to pay my lawyers anything they want if I get sued for anything related to your use of the model for anything.*

*Have a nice day.*

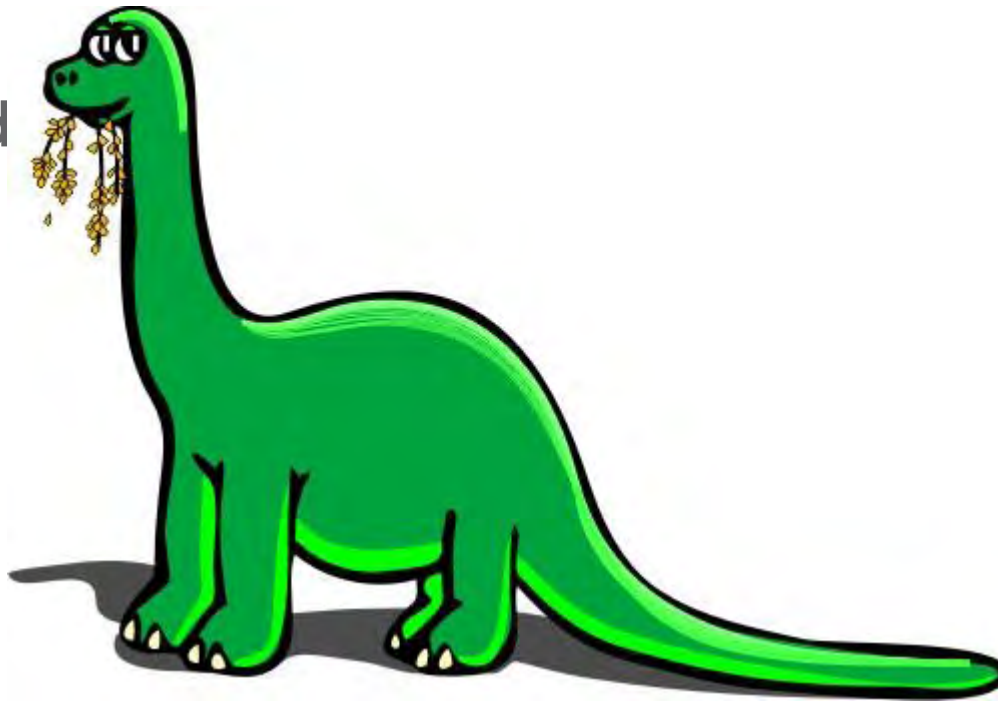
# Response?

## Disclaimer Approach:

Some of it's not reliable so don't rely on any of it.

Specified

Some



What I say you can.



Pad Footing	LoD 100	LoD 200	LoD 300
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# BIMFORUM

# LOD Definitions

- 100 Conceptual.** The Model Element may be graphically represented in the Model with a symbol or other generic representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.
- 200 Generic Placeholders.** The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
- 300 Specific Assemblies.** The Model Element is graphically represented within the Model as a specific system, object or assembly accurate in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
- 400 Detailed Assemblies.** The Model Element is graphically represented within the Model as a specific system, object or assembly that is accurate in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element.

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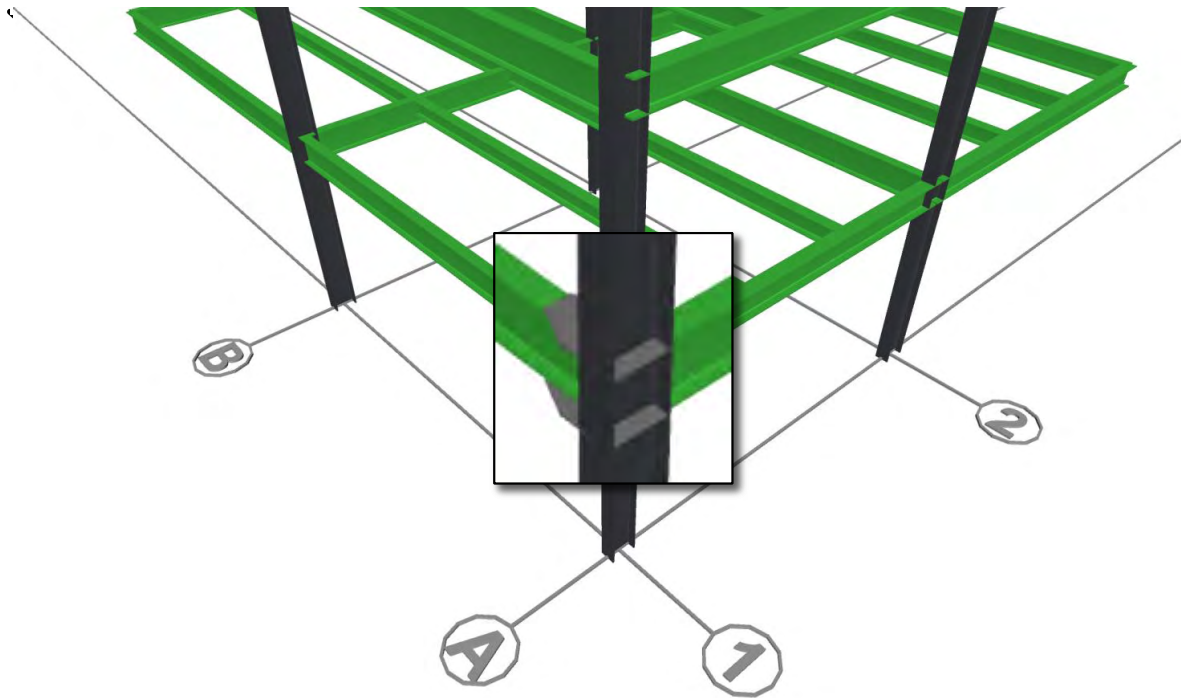
# LOD Definitions

→ LOD 100  
Conceptual

→ LOD 200  
Generic  
Placeholders

→ LOD 300  
Specific  
Assemblies

→ LOD 400  
Details





# Level of Development vs. Level of Detail

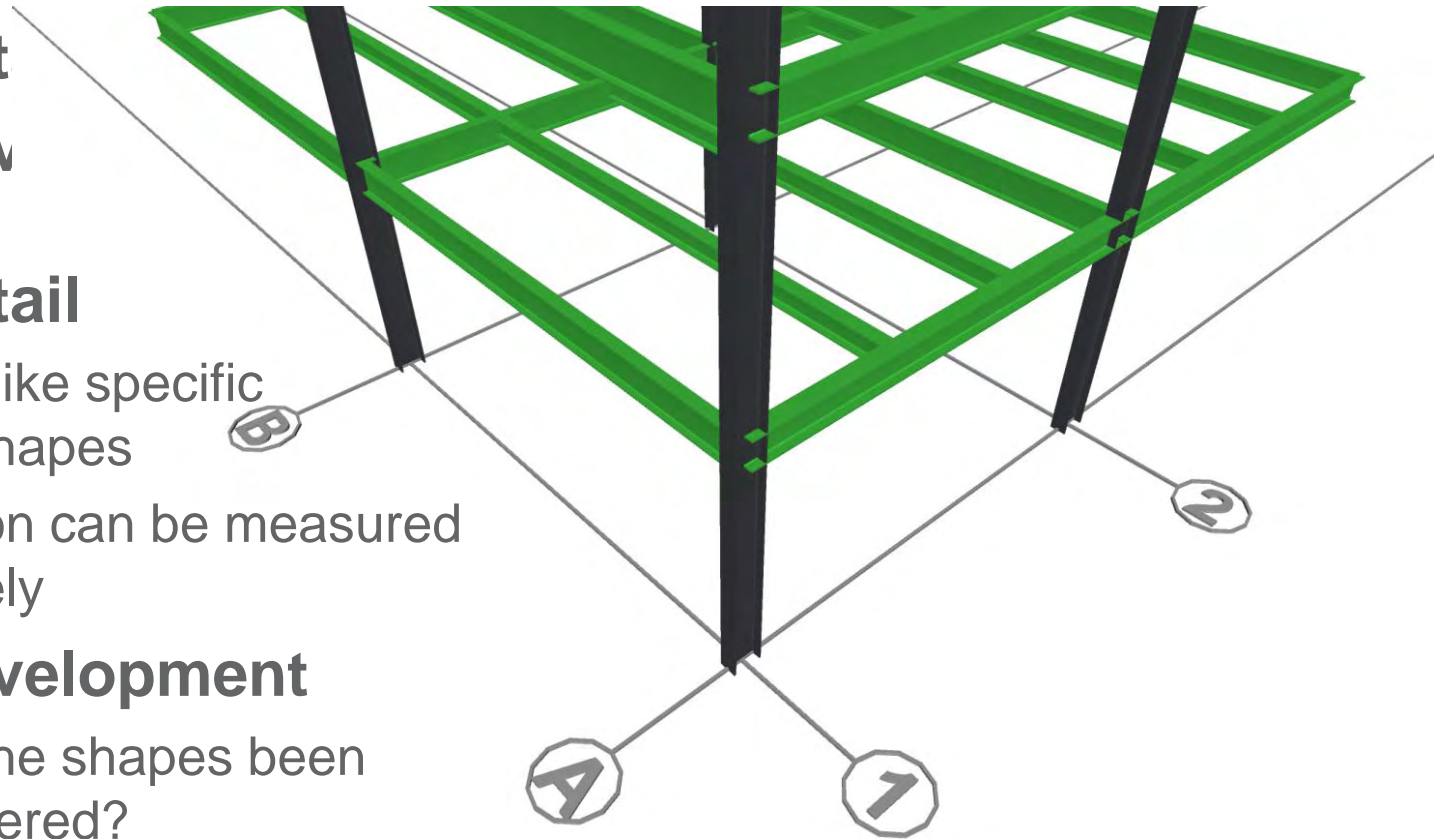
Level of **Det**  
Level of **Dev**

Level of **Detail**

- Looks like specific steel shapes
- Location can be measured precisely

Level of **Development**

- Have the shapes been engineered?
- Are they in the final locations?



# LOD Definitions

- 100** Estimate it.
- 200** Specify it.
- 300** Buy it.
- 400** Build/Install it.
- 500** Operate it.

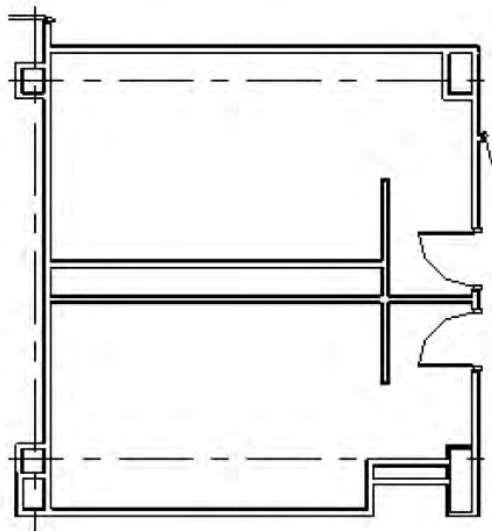
**DETAIL = Input\***

**DEVELOPMENT = Reliability**

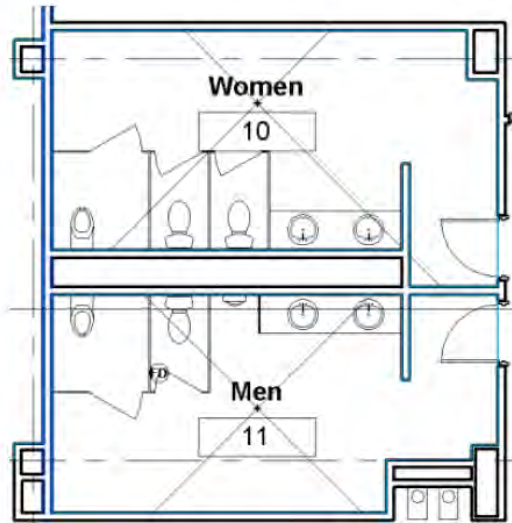
*\* Usually more Input than Reliability*

# Use of LODs

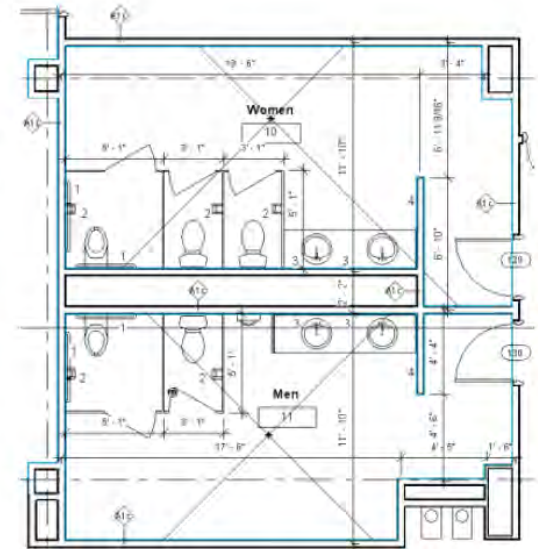
- No correspondence with design phase
- No such thing as an “LOD ### model”



Level 100 Floor Plan



Level 200 Floor Plan



Level 300 Floor Plan



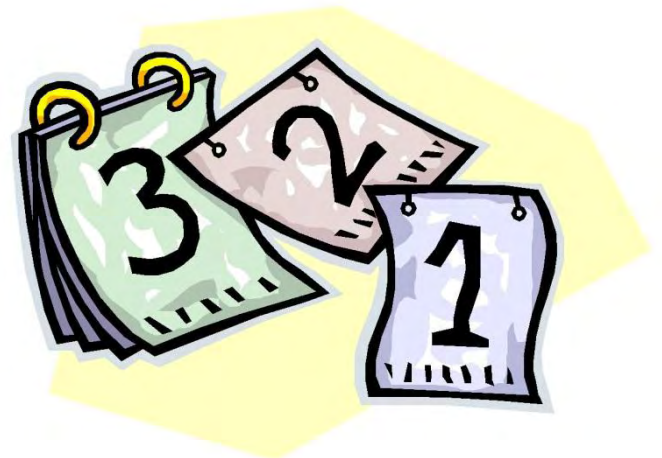
# Use of LODs

- Use LODs with a model disclaimer?
- Authorized Uses? (in AIA E202)
  - Within Integrated Project Delivery
  - Traditional delivery methods



# LOD Catalog: History

- AIA + AGC BIMForum working group
  - Signed MOU using same definitions, develop together
- Launched early 2011
- Bi-weekly meetings
- Meeting with BIMForum Technology Subforum
  - Supporting LOD implementation in software



# LOD Catalog: Purpose

- Stakeholder expectations
  - Design team (INPUT)
  - Fabricators, builders, owners... (RELIABILITY)
- Facilitate sharing of model information
- Solving the 'garbage in, garbage out' problem
- Submit as a standard – NBIMS?



# LOD Catalog: The Team

## Core Team:

- Jim Bedrick
- Jan Reinhardt – Adept Proj. Del.
- Will Ikerd – Ikerd Consulting
- James Vandezande – HOK
- Bob Middlebrooks – Autodesk
- David Francis – Southland Ind.
- Dmitri Alferieff – AGC
- Marcel Broekmaat – Vico Software
- Mike Bomba – AIA
- Ricardo Khan – Mortenson
- Rodd Merchant – JE Dunn
- Ron Dellaria – Astorino
- Walt Cichonski – LF Driscoll



+17 other members

## Sub-Groups:

- Chairs are  
1 designer + 1 builder

## Categories:

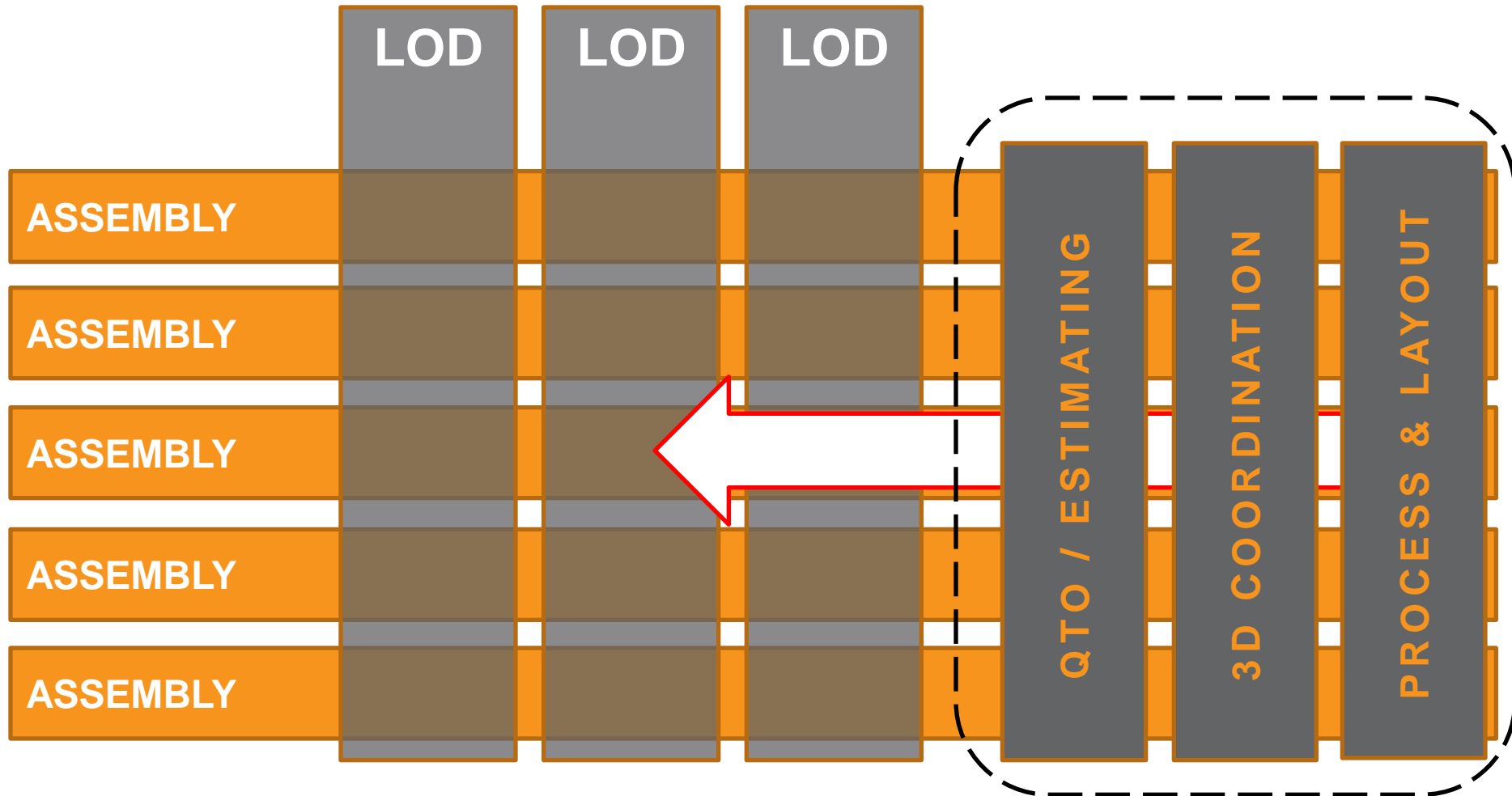
- Sub/Super-Structure
- Exterior Enclosure
- Interior Construction
- M/E/P

# LOD Catalog: Progress

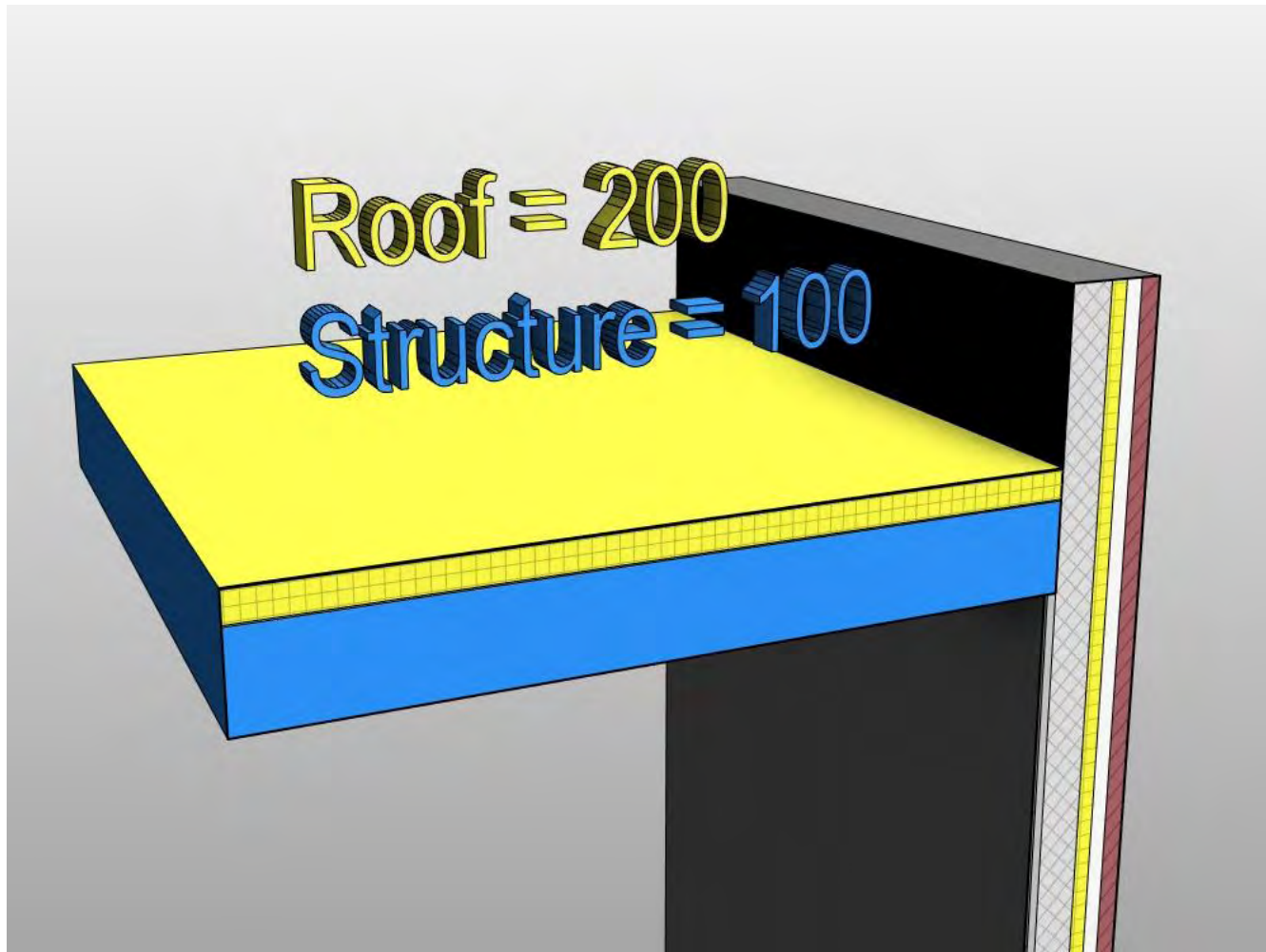
- Refining overall definitions
- Assessing downstream uses:
  - QTO / Estimating
  - 3D Coordination
  - 3D Control and Planning (Layout)
- Catalog development:
  - Descriptive input requirements
  - Information requirements (IFC reference)
  - Graphic/model examples



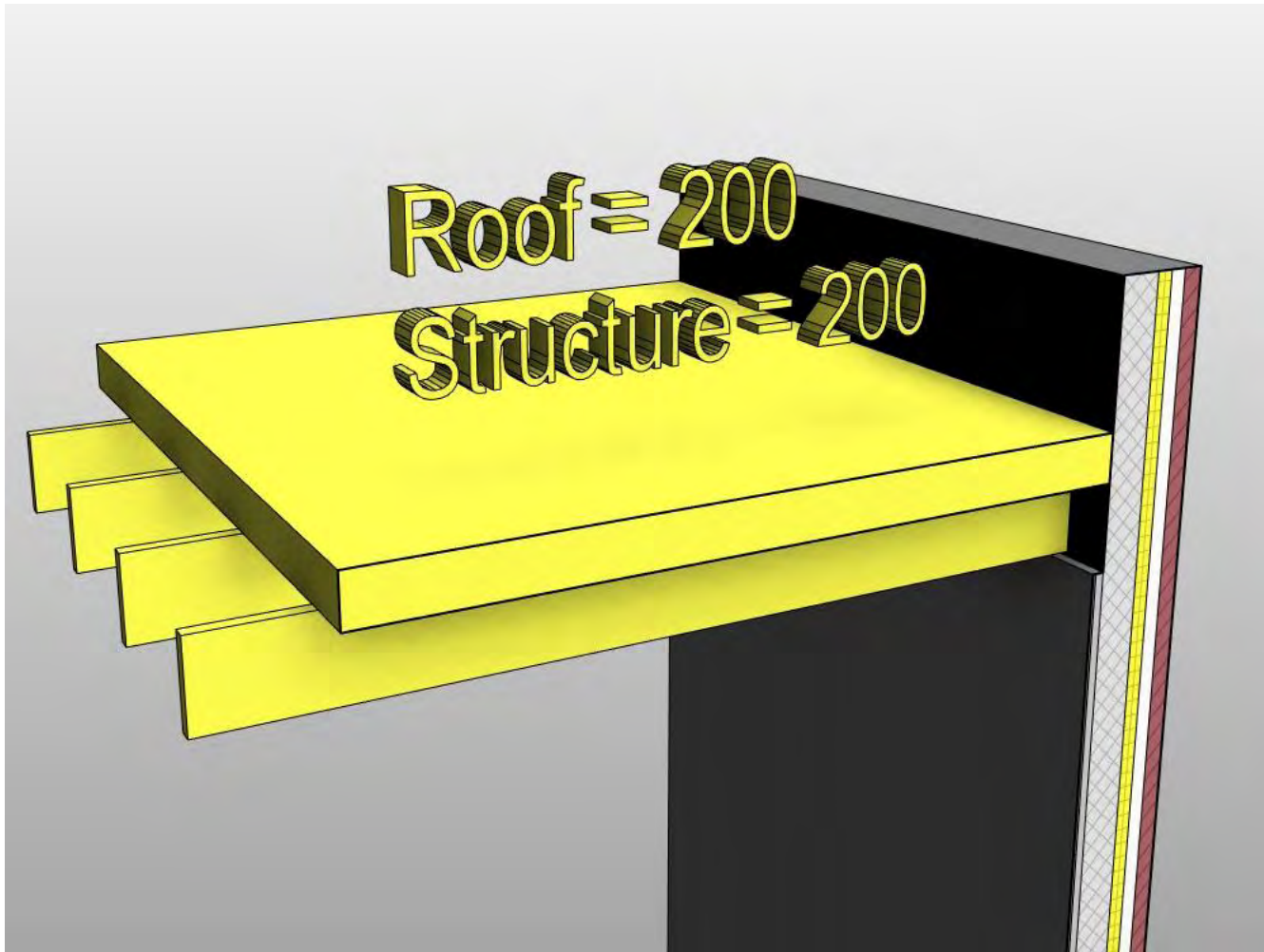
# LOD Catalog: Progress



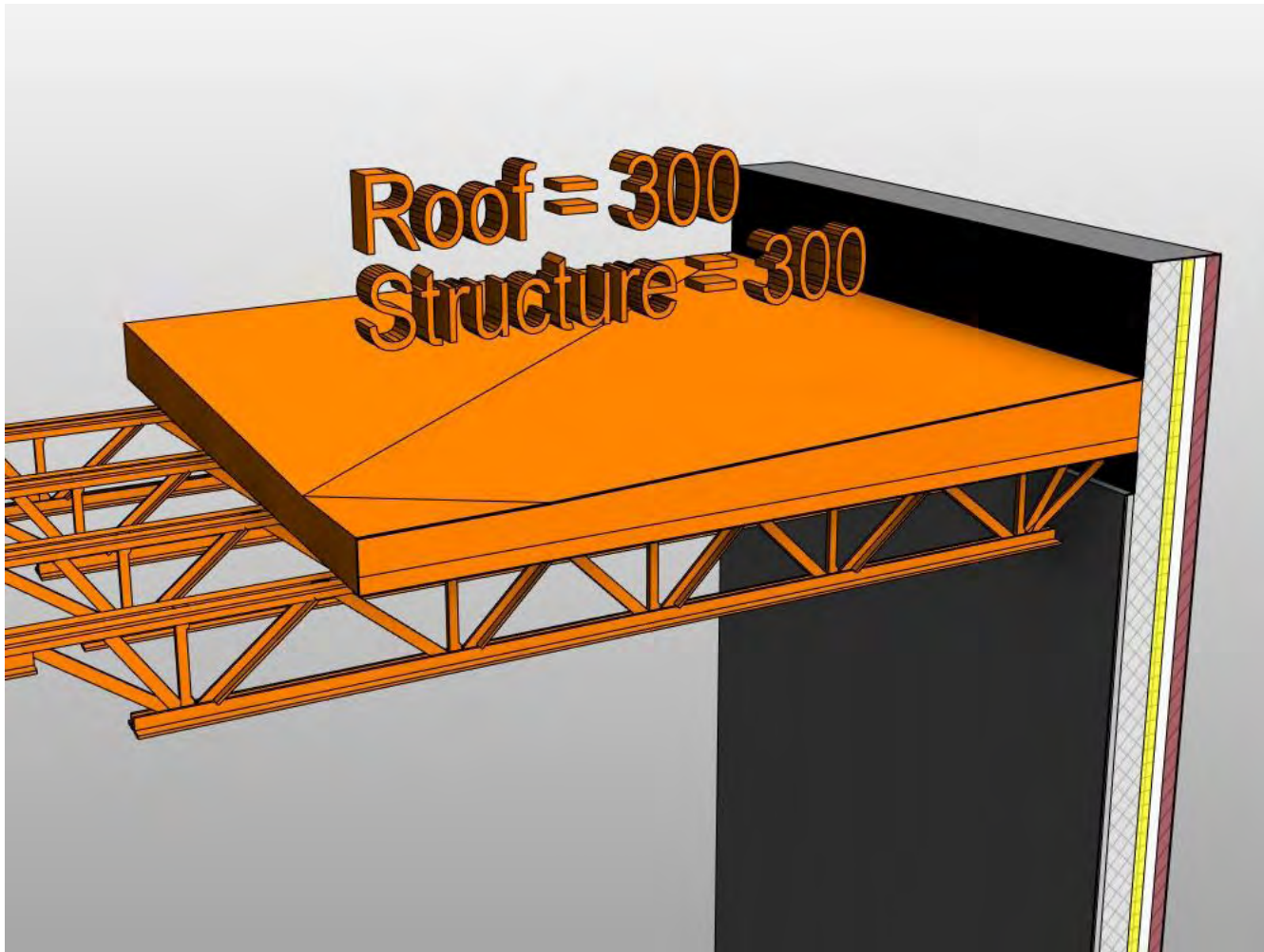
# LOD Catalog: Current Examples



# LOD Catalog: Current Examples

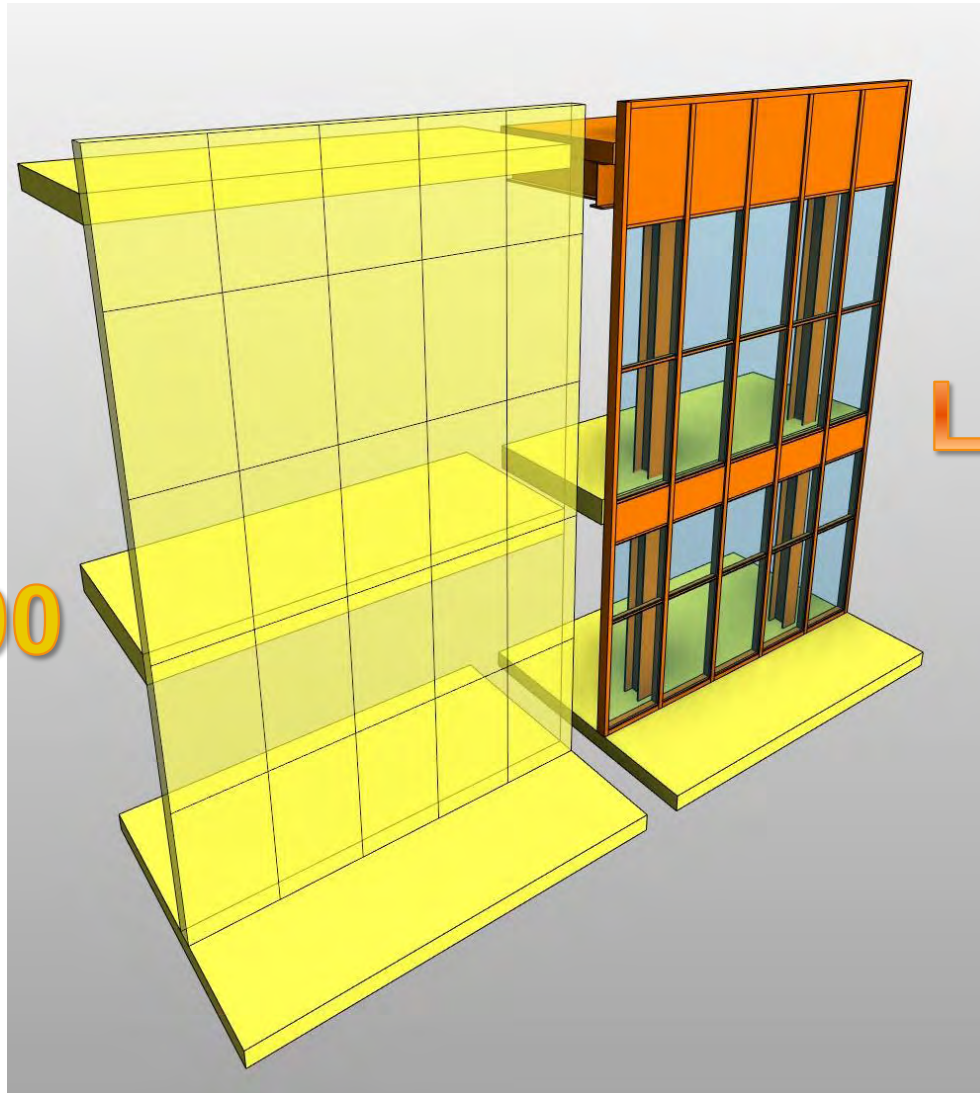


# LOD Catalog: Current Examples



# LOD Catalog: Current Examples

LOD200

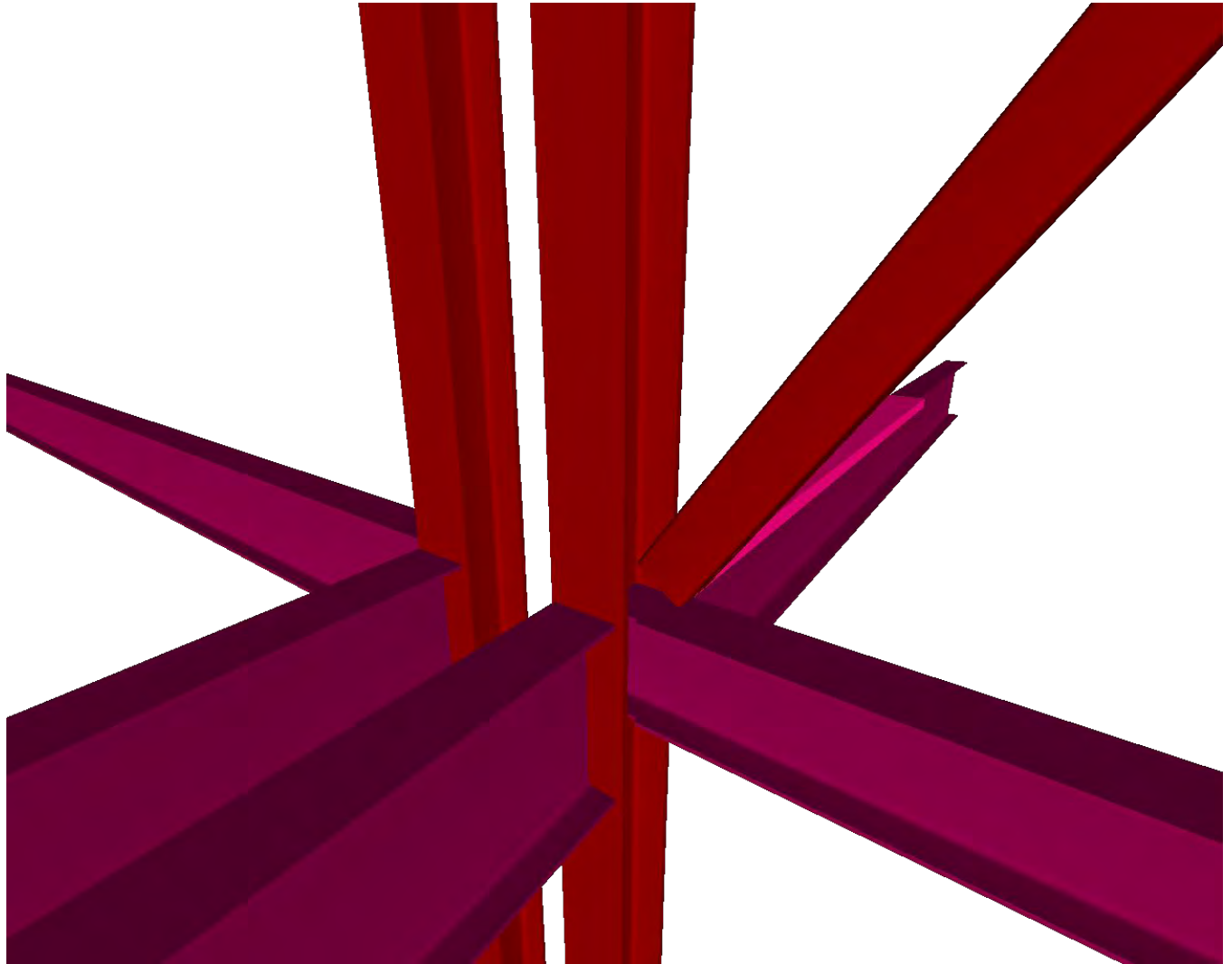


LOD300



# LOD Catalog: Current Examples

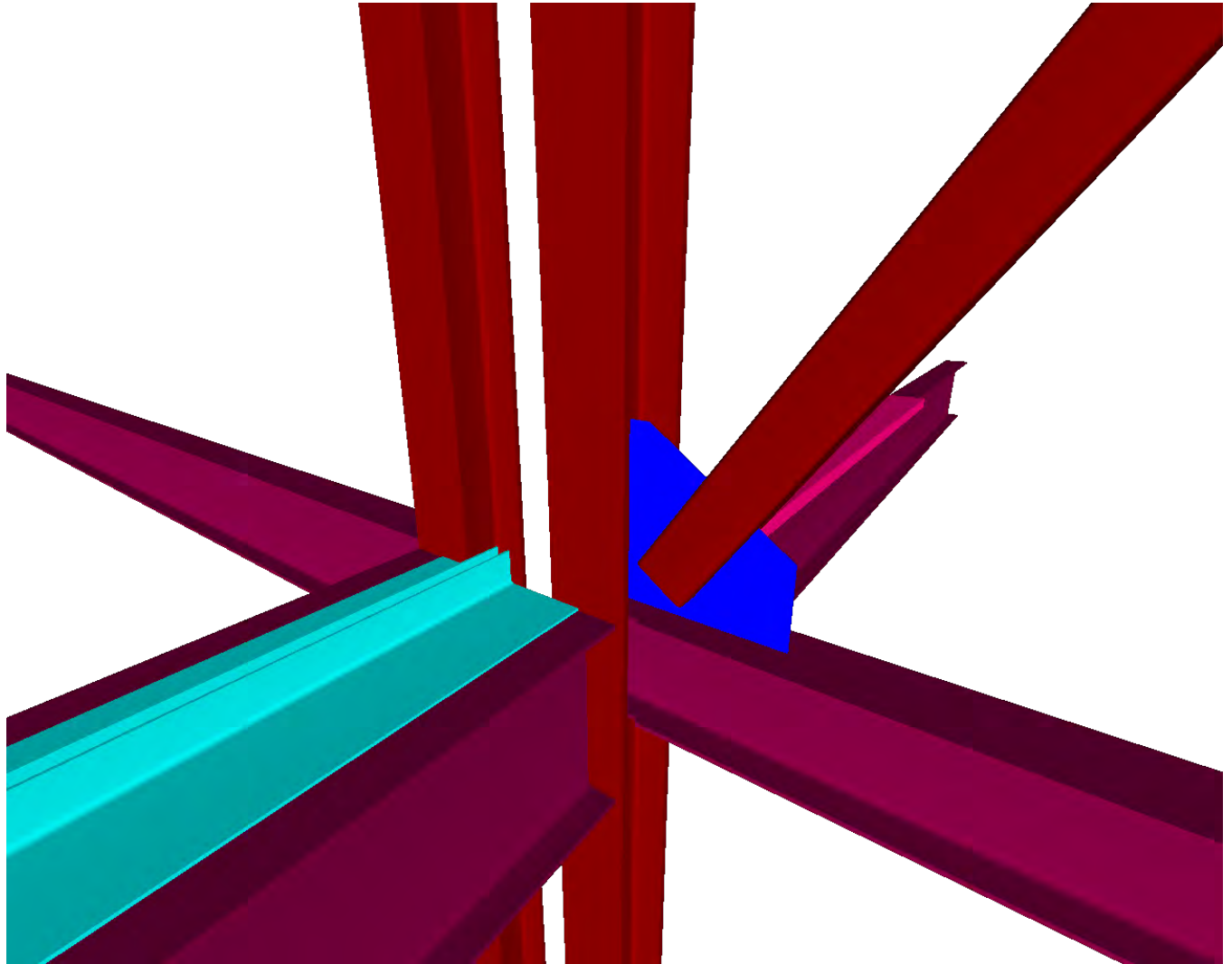
- LOD 300



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# LOD Catalog: Current Examples

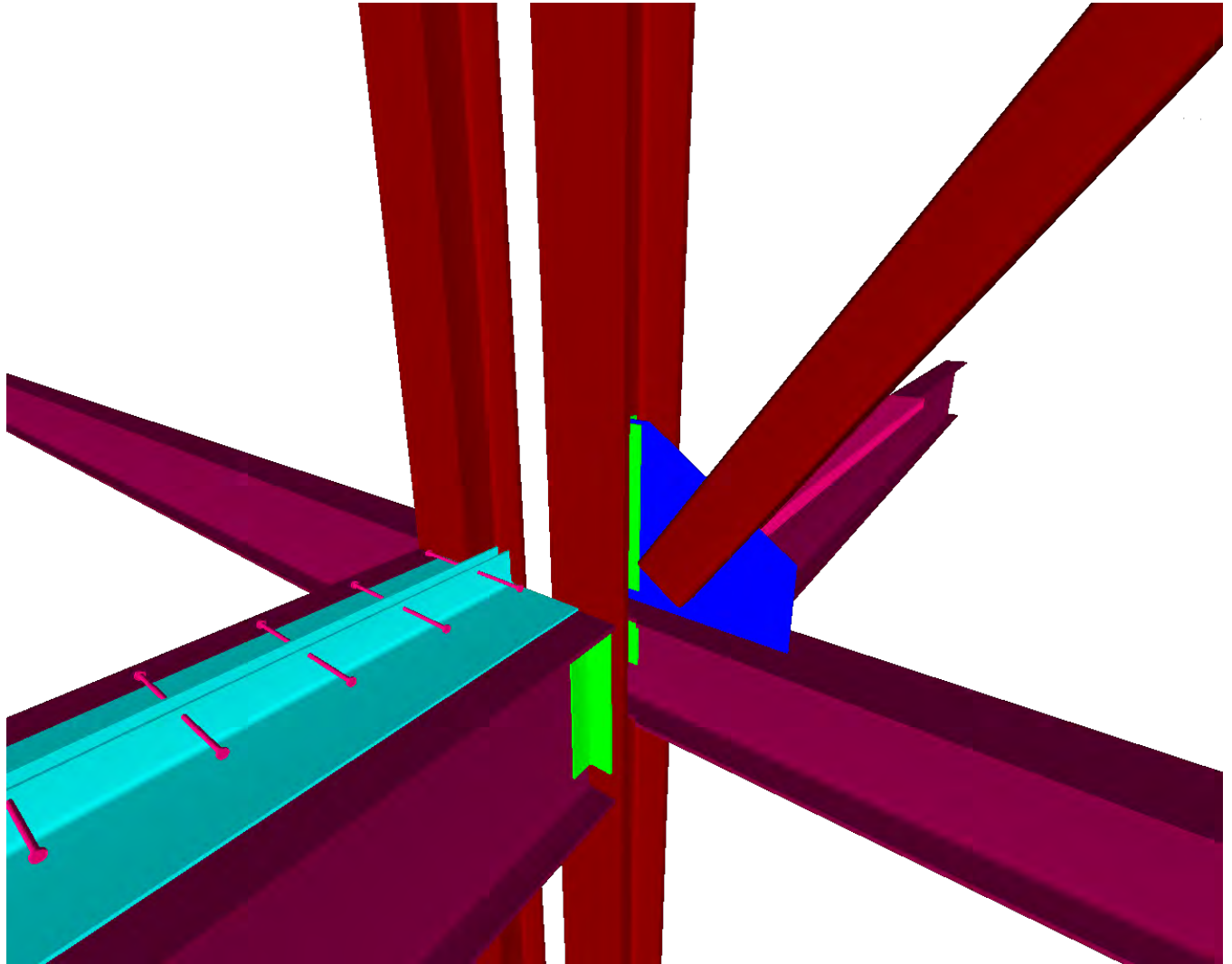
- LOD 350



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# LOD Catalog: Current Examples

- LOD 400



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# LOD Catalog: Current Examples

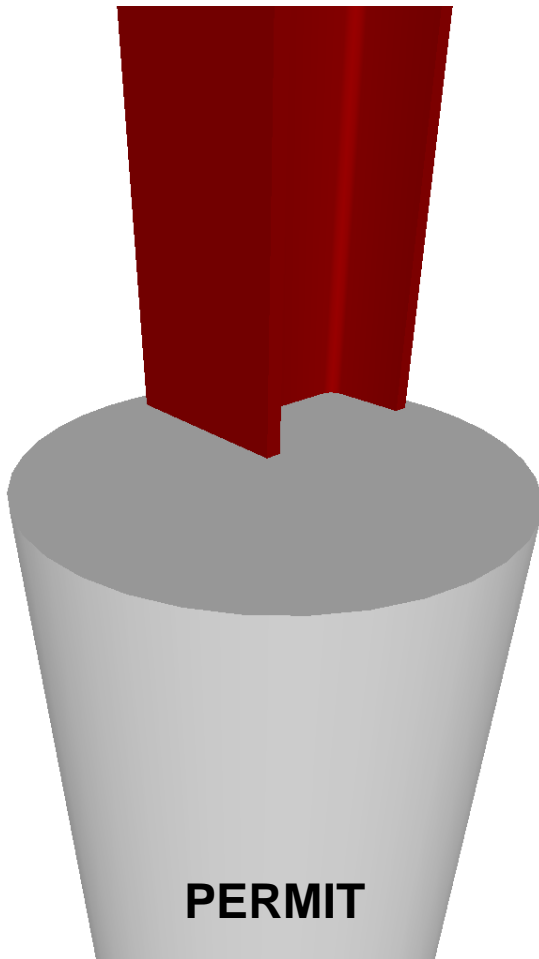
300



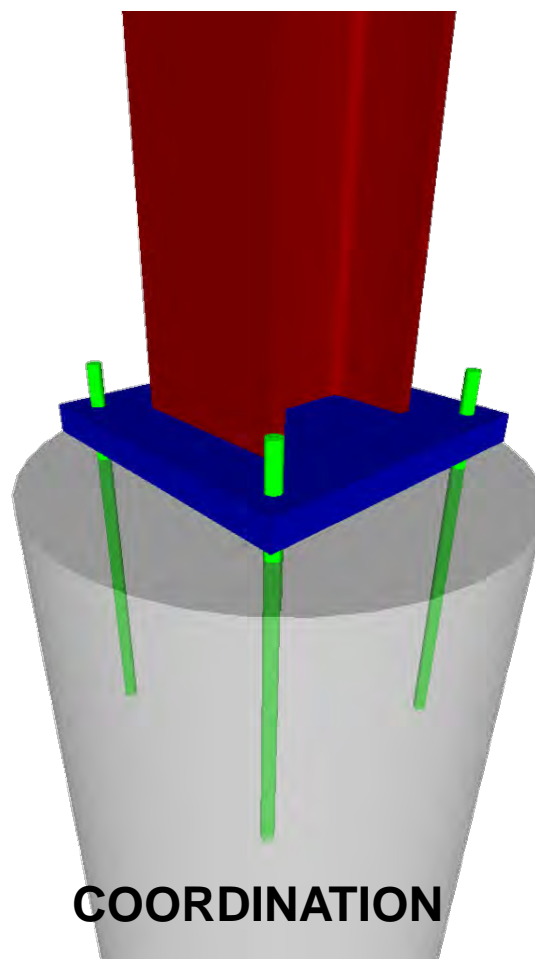
350



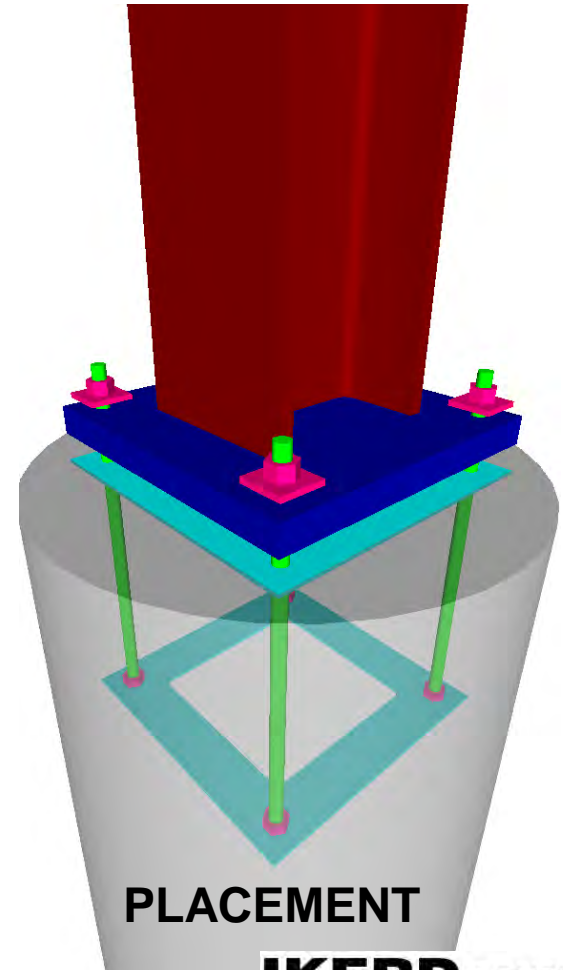
400



PERMIT



COORDINATION



PLACEMENT

**IKERD** CONSULTING

# LOD Catalog: Next Steps

- Delivery format for catalog
- LOD500
  - Record Model vs. As-Built?
- Operations & Maintenance
  - Integration with CAFM platform?



# Discussion



# Working Group Co-Chairs

System	Designer	Builder
Sub/Super-Structure	Will Ikerd <a href="mailto:wikerd@ikerd.com">wikerd@ikerd.com</a>	Rodd Merchant <a href="mailto:Rodd.Merchant@jedunn.com">Rodd.Merchant@jedunn.com</a>
Exterior Enclosure	James Vandezande <a href="mailto:james.vandezande@hok.com">james.vandezande@hok.com</a>	Walt Cichonski <a href="mailto:wcichons@lfdiscoll.com">wcichons@lfdiscoll.com</a>
Interior Construction	Ron Dellaria <a href="mailto:RDellaria@Astorino.com">RDellaria@Astorino.com</a>	Rick Kahn <a href="mailto:Ricardo.Khan@mortenson.com">Ricardo.Khan@mortenson.com</a>
M/E/P	Bob Middlebrooks <a href="mailto:Robert.middlebrooks@autodesk.com">Robert.middlebrooks@autodesk.com</a>	David Francis <a href="mailto:davidf@southlandind.com">davidf@southlandind.com</a>